

The Curious Case of the CatRescue: Can Picture Narrative Description Inform Visuospatial Processing in Aphasia?

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Introduction

- Visuospatial and language processing are distinct yet interconnected domains essential for human communication.
- People with aphasia (PWA) often experience co-occurring nonlinguistic cognitive deficits in addition to language challenges.
- Picture descriptions may better reflect everyday communication tasks and associated cognitive loads than traditional standardized tasks.
- Embeds visuospatial processing in an ecologically valid context.
- May allow insights into connections between language and visuospatial processing not observed through other tasks.
- Core lexicon analysis is a checklist-based, normed discourse measure which lends itself well to this investigation, consisting of items produced by at least 50% of a healthy control participant (HCP) normative sample when narrating a story.
- Includes nouns, verbs, adjectives, and adverbs, as well as functors.

Purpose

- Investigate differences between HCP and PWA with respect to the timing, order, and spatial location of core lexicon items produced during the *Cat Rescue* picture description task.

Methods

Aphasiabank *Cat Rescue* Transcripts

- HCP = 299; PWA = 384 (See Table 1 for demographics)
- Computerized Language Analysis (CLAN) software was used to extract core lexicon productions and timing (measured in ms from the start of the task).
- Statistical analyses included only those core lexicon items that could be assigned to a quadrant (e.g., Figure 1).

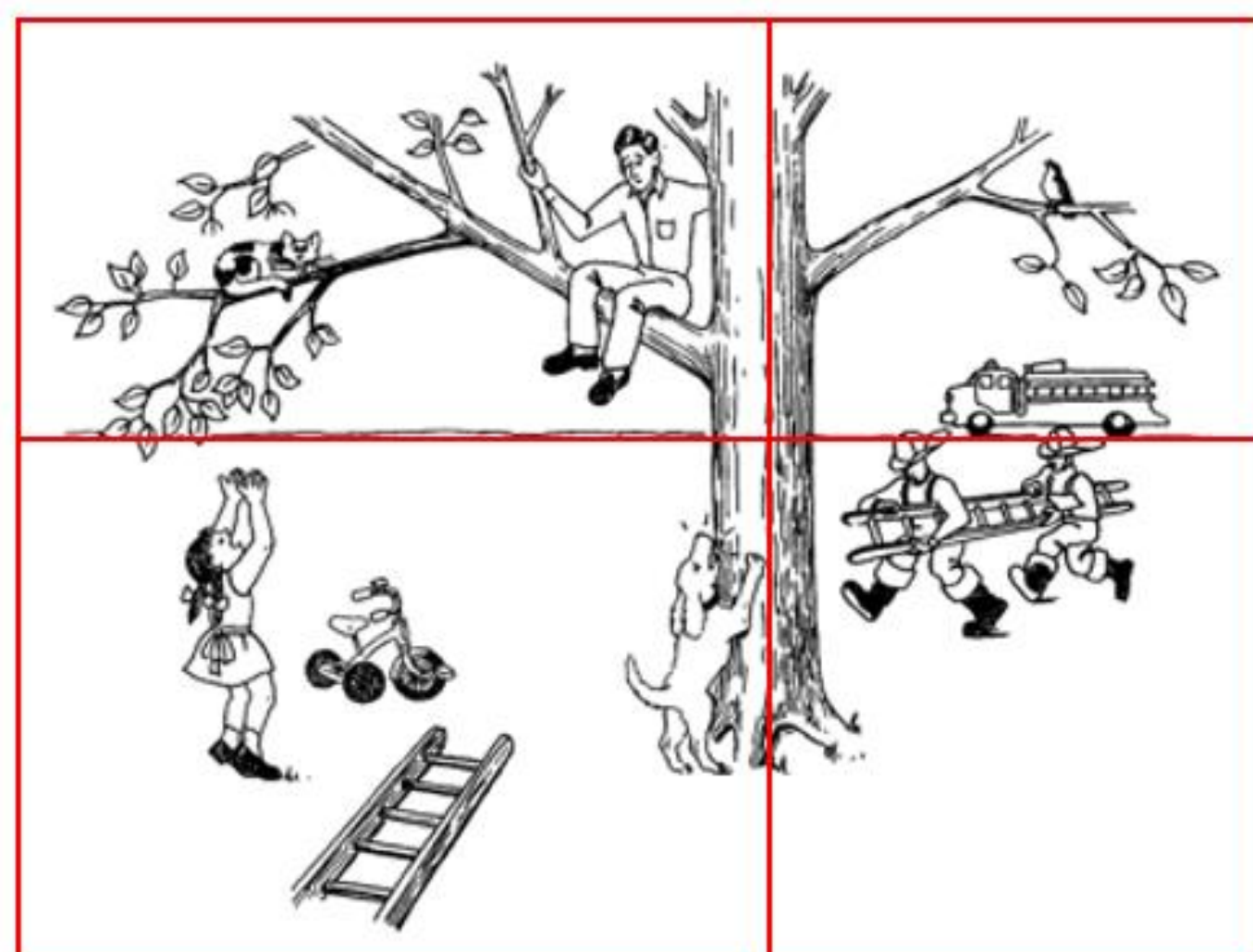
Table 1. Summary of participant demographic information across groups and by aphasia severity.

Participants	Age (yrs)			Education (yrs)			Sex		Race/Ethnicity										
	Mean (SD)	Range	MIS	Mean (SD)	Range	MIS	F	M	AA	AI	AS	HL	MIX	NH	OTH	WH	MIS		
HCP (N = 299)	57 (21)	18-90	1	16 (2.7)	10-25	12	174	125	9	-	3	9	-	-	-	241	37		
PWA (N = 384)	61 (12)	25-91	2	16 (3)	7-25	17	154	230	39	1	5	6	4	2	2	310	15		
Latent (N = 55)	59 (14)	25-80	-	17 (3.5)	10-24	2	32	23	3	-	1	2	1	1	1	40	6		
Mild (N = 134)	62 (12)	31-86	1	16 (3)	12-25	5	50	84	9	-	2	2	-	-	1	115	5		
Moderate (N = 130)	61 (12)	26-91	-	15 (3)	7-25	5	55	75	19	1	2	2	2	1	-	101	2		
Severe (N = 44)	63 (13)	25-83	-	15 (3)	8-20	4	13	31	7	-	-	-	1	-	-	35	1		
Profound (N = 10)	69 (9)	56-85	-	17 (3)	12-23	-	0	10	-	-	-	-	-	-	-	10	-		

AA – African American; AI – American Indian; AS – Asian; F – Female; HL – Hispanic or Latino; M – Male; MIS – Missing; MIX – Mixed; NH – Native Hawaiian; OTH – Other; WH – White.
*This group includes 11 individuals who are missing aphasia severity data and are excluded from the severity sub-group analysis

Statistical Analysis

- One-way ANOVA was used to confirm group differences in total core lexicon production.
- Survival analysis examined how many individuals in each group produced individual core lexicon items and time elapsed before core lexicon word production.
 - Plots the proportion of each group which produced the core lexicon item across time.
 - Log-rank χ^2 tests used to identify significant group differences in survival curves.



Presented at the 2025 Annual Meeting of the Academy of Aphasia, San Diego, CA.

Please scan this QR Code to view and download references.

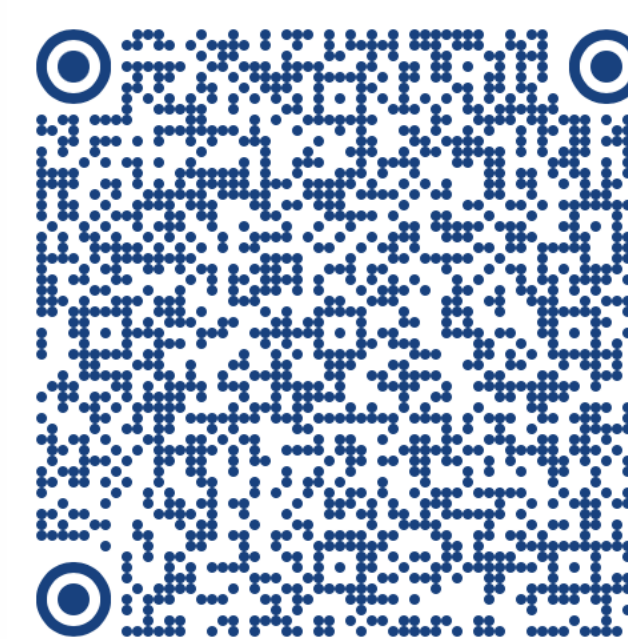
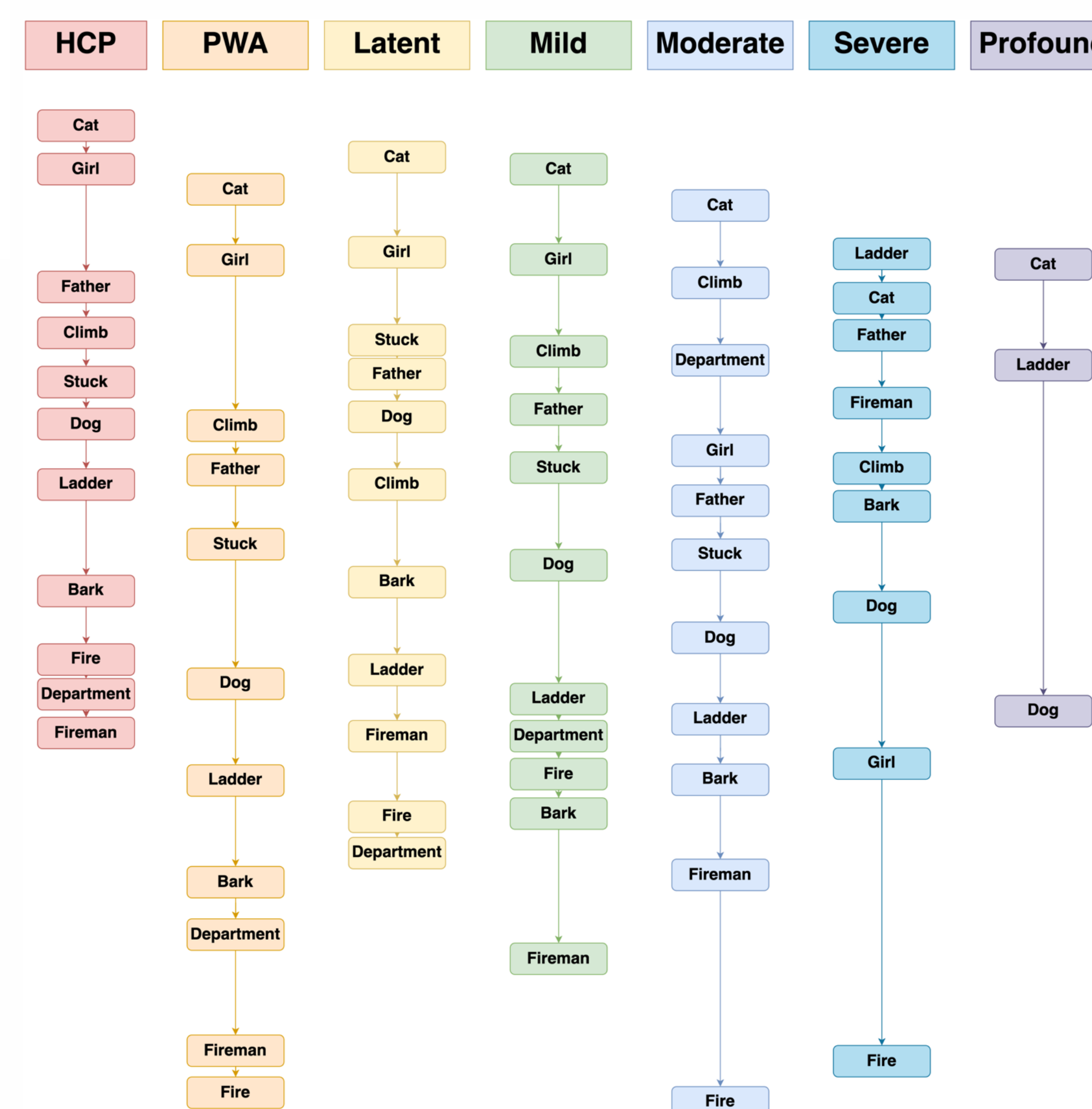


Figure 1 (left). Quadrants developed for the *Cat Rescue* picture (Nicholas and Brookshire, 1993).

Figure 3 (below). Order of production of core lexicon words by group, based on the median time to produce each item. A larger vertical distance between the group label and the first core lexicon item reflects a longer time taken to produce that first item. Similarly, vertical distance between words indicates the relative timing of words, with larger distances indicating increased time between production of one core lexicon item and the next.



Discussion

- Within each quadrant, PWA processed visual scene elements similarly to HCP, although with slowed attention, production of the most salient core lexicon items, or both.
- PWA required significantly more time to produce core lexical items compared to HCP except for the word “fireman”.
- These differences are not fully explained by demographic, psycholinguistic, production order, or speech rate variables.
- PWA with greater severity produced core lexicon items at a greater delay than HCP and PWA with milder deficits.
- Differences in the order of producing core lexicon does not seem to be directly related to severity.
- Research using eye-tracking methods may help elucidate the underlying mechanism of this finding.
- Results offer preliminary evidence for clinical utility of discourse tools in measuring visuospatial behavior during language performance in PWA.
- It will be important to develop experimental paradigms that can accommodate picture description tasks that are personally meaningful for PWA (e.g., personal photographs).
- Core lexicon analysis can be a useful clinical tool for concurrent assessment of visuospatial processing and discourse in PWA.

Results

- One-way ANOVA revealed group differences ($F[5,666] = 181.842, p < .001, \eta^2 = .577$) with HCP producing significantly more core lexicon items than PWA.
- Kaplan-Meier survival analysis revealed that HCP produced the first core lexicon item in each quadrant in a significantly shorter time than PWA (Figure 3; Table 2).

Figure 2. Kaplan-Meier survival curves showing the time to production of the first core lexicon item in each quadrant.

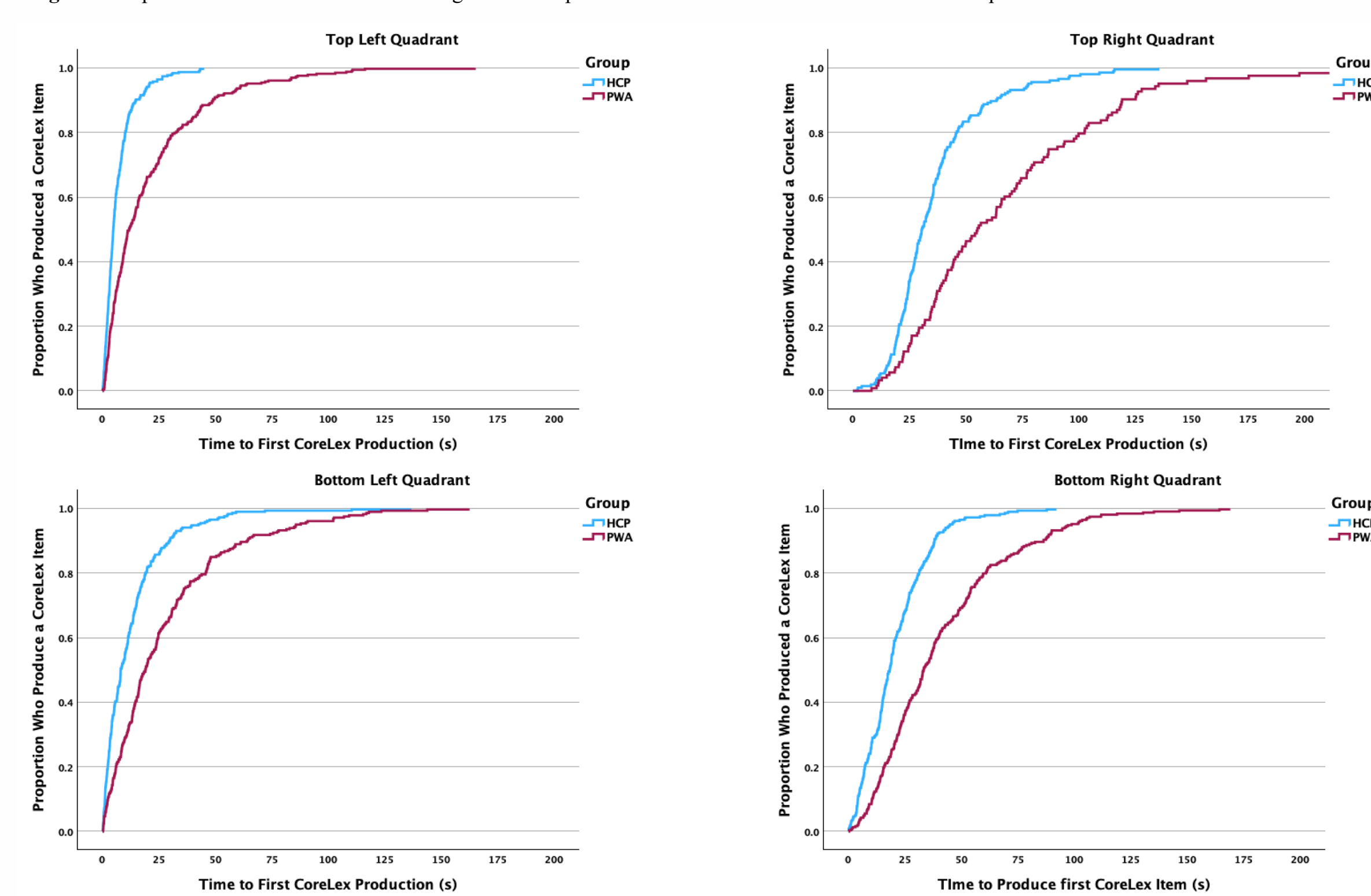


Table 2. Results of log-rank χ^2 tests examining differences in survival curves between HCP and the aphasia severity groups.

Core Lexicon Item	Log-Rank χ^2	Time Difference (s)	Log-Rank χ^2	Time Difference (s)	Latent Aphasia		Mild Aphasia		Moderate Aphasia		Severe Aphasia	
					Log-Rank χ^2	Time Difference (s)	Log-Rank χ^2	Time Difference (s)	Log-Rank χ^2	Time Difference (s)		
Bark	3.23	+7.30	0.034	+18.89	12.59*	+21.89						
Call	9.70*	+13.00	64.78*	+13.50	97.91*	+24.19						
Cat	10.58*	+4.43	42.57*	+6.58	82.460*	+9.45	100.86*	+17.48				
Climb	3.27	+11.21	51.95*	+7.43								
Department	8.85*	+11.54	48.19*	+14.04								
Dog	2.30	+4.59	26.36*	+18.22	59.62*	+22.51	46.28*	+19.36				
Father	6.67*	+7.30	38.06*	+11.45	86.00*	+17.24	39.62*	+9.90				
Fire	7.79*	+11.19	25.57*	+14.74	57.82*	+47.22						
Fireman	4.01*	+6.81	7.18*	+8.00	0.06	+21.56						
Girl	0.45	+13.97	5.44*	+22.40	45.89*	+24.21						
Ladder	8.86*	+3.41	36.64*	+11.15	81.88*	+16.42						
Stuck	5.83*	+2.86	29.71*	+7.29	52.90*	+20.64						
Tree	14.85*	+6.91	91.40*	+27.74	232.11*	+22.03						

* $p < 0.05$

- Although HCP and PWA broadly produced core lexicon items in the same order, differences were noted across aphasia severities (Figure 3).